

Diabetic Foot and Chronic Kidney Disease

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Diabetic Foot Syndrome

- ∞ The term Diabetic Foot Syndrome includes; PN, PAD, DF Ulceration, deformity, Infection and Charcot Foot

Agenda

- ∞ **Incidence of DF Disease in Relation to the Degree of Renal Impairment**
- ∞ **Risk Factors For Foot Disease in those with Diabetes and Renal Disease**
 - Peripheral neuropathy
 - PAD
 - Infection
 - Dialysis
 - Reduced ability to perform foot self-care
 - Anemia
 - Lack of Foot Care visit to Foot Clinic
 - DEPRESSION
- ∞ **Some Specific Foot Diseases**
 - Neuro-Osteo-Arthropathy = Charcot Foot
 - Diabetic Foot Ulceration

The Incidence of DF Disease in Relation to the Degree of Renal Impairment

∞ Renal disease

A retrospective cohort study at a tertiary Centre in Germany demonstrated a strong association between the degree of renal functional impairment and foot disease in subjects with both Type 1 and Type 2 diabetes

∞ Hemodialysis

∞ Continuous ambulatory peritoneal dialysis:

∞ Renal transplantation:

∞ Simultaneous pancreas and kidney transplantation (SPK):

Charcot foot neuroarthropathy in a cohort of subjects with previous simultaneous pancreas-kidney transplantation (SPK) has been described to be high at 12%

Margolis et al, 2008 ; Diabetes Care 31, 1331–1336

Ndip et al. 2010; Current Diabetes Reports 10, 283-290

Wolf et al 2010; Nephrology Dialysis Transplantation 24, 1896–1901

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Risk Factors For Foot Disease in those with Diabetes and Renal Disease

∞ Peripheral neuropathy:

- The microvascular disease process in diabetes that causes nephropathy too.
- The extent of peripheral neuropathy mirrors the extent of nephropathy as the retinopathy does.
- Even if diabetes is not the cause of end-stage renal failure, peripheral neuropathy is often present through:
 - Uremic PN
 - Other causes of end-stage renal failure such as the vasculitides.

Risk Factors For Foot Disease in those with Diabetes and Renal Disease

∞ Peripheral vascular disease PAD :

- PAD is higher in patients with both diabetes and renal disease.
 - In the Atherosclerosis Risk in Communities (ARIC) Study, the relative risk of incident PAD (defined as ankle-brachial index <0.9 or new intermittent claudication) was 1.56 in those with CKD compared to those with normal kidney function when adjusted for age, gender, race and cardiovascular disease risk factors
- A prevalence of 20% has been demonstrated in those on peritoneal dialysis

Wattanakit et al, 2007; Journal of the American Society of Nephrology 18, 629–636.

Liu et al, 2009; Peritoneal Dialysis International 29, 64–71

Risk Factors For Foot Disease in those with Diabetes and Renal Disease

∞ Infection :

- Uremia compromises many aspects of the mechanisms of defense against infection
- So, a greater proportion of foot ulcers will be infected on first presentation, and will have deeper seated infection such as osteomyelitis with higher morbidity including amputation

Risk Factors For Foot Disease in those with Diabetes and Renal Disease

∞ Dialysis therapy:

- Dialysis therapy is a predictor for foot ulceration in diabetes independently of the presence of other cofounders as neuropathy, peripheral vascular disease, foot self-care measures and ethnicity

Ndip et al; Diabetes Care 33, 1811–1816.

Risk Factors For Foot Disease in those with Diabetes and Renal Disease

∞ Reduced ability to perform foot self-care:

- Reduced visual caused by retinopathy
- Reduced joint mobility to perform foot inspection.
- In a study of subjects on dialysis, 42.2% with diabetes, only 75% had adequate vision and 55% adequate flexibility to perform self-care

Locking-Cusolito et al; 2005; Nephrology Nursing Journal 32, 373–384

Risk Factors For Foot Disease in those with Diabetes and Renal Disease

∞ Anemia:

- Associated with poor tissue oxygenation and impaired wound healing

∞ Lack of Foot Care visit to Foot Clinic :

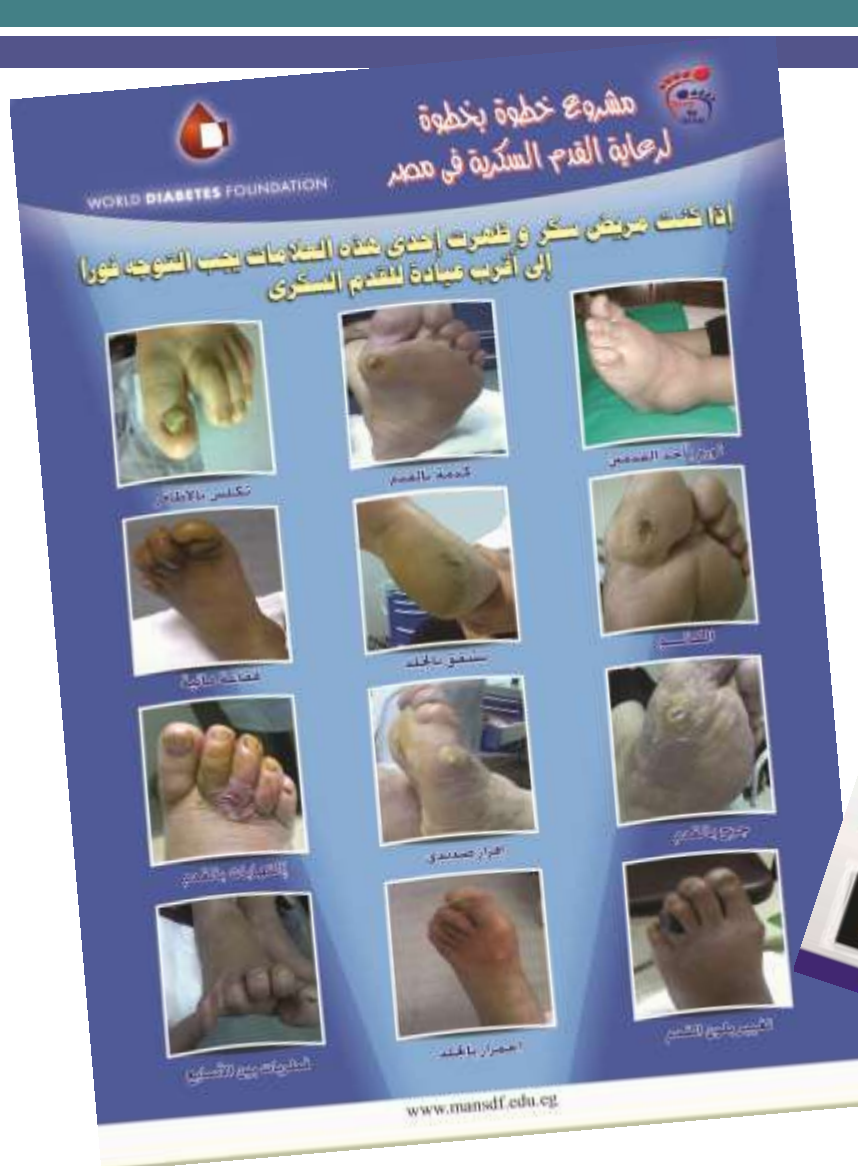
- hemodialysis 3X/ weekly may result in subjects neglecting other aspects of their care such as foot care
- Depression may affect compliance and attendance at other clinics, particularly for those on hemodialysis

Lawrence 2004; EDTNA.ERCA.J. 30, 153–156

Afsar and Akman2009 ; Kidney International 76, 679–680.



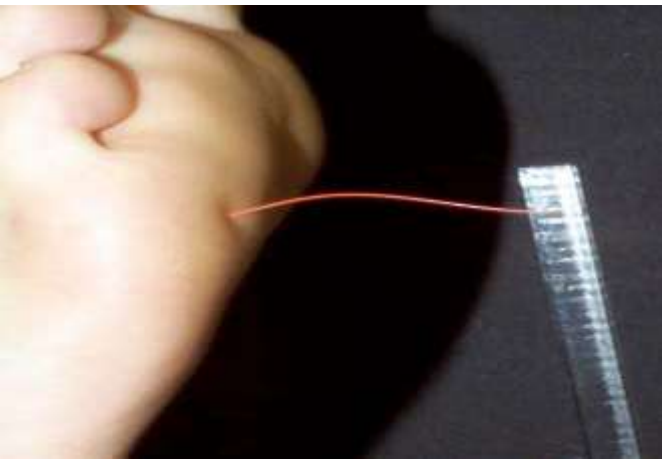
Educational illustrative Material



Annual Foot Screening

- ✎ Neuropathy
- ✎ Vascular
- ✎ Deformity
- ✎ Skin
- ✎ Nail
- ✎ Footwear

Annual Foot Screening



Amman Dec 2014



Risk Categorization

Category	Risk profile	Check up frequency
0	No sensory neuropathy	Once a year
1	Sensory neuropathy(DN)	Once/ 6 month
2	DN and PAD and/or foot deformities	Once /3 month
3	Previous ulcer/Amputation	Once 1month

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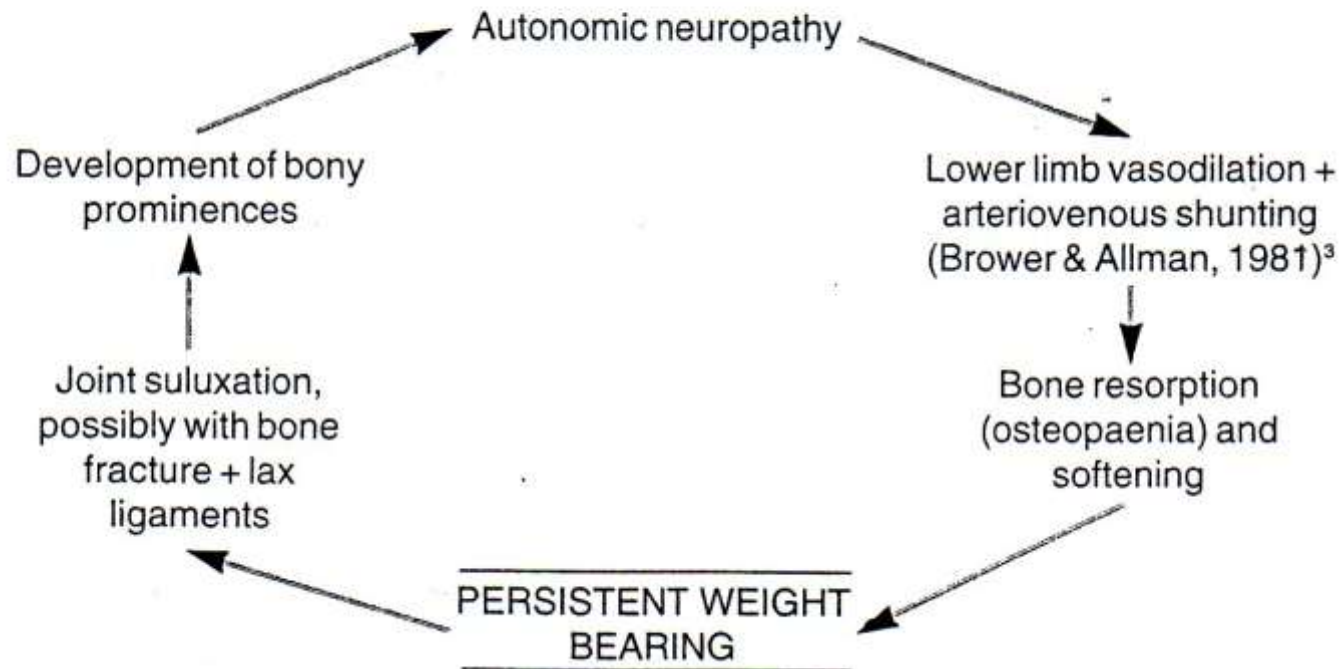
Charcot Foot



Charcot Neuroarthropathy

French, Neurovascular Theory (Charcot, 1868)

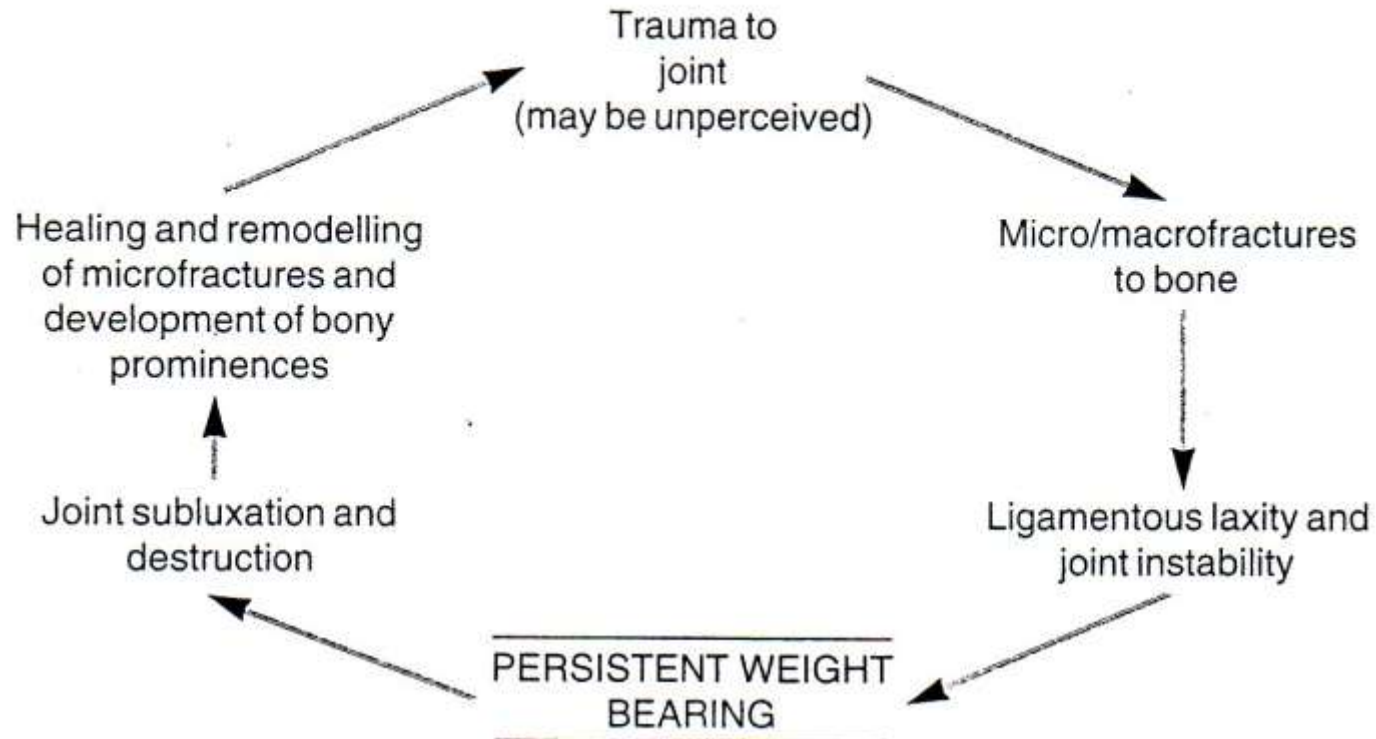
NEUROVASCULAR THEORY (after Charcot, 1868)¹⁶



Charcot Neuroarthropathy

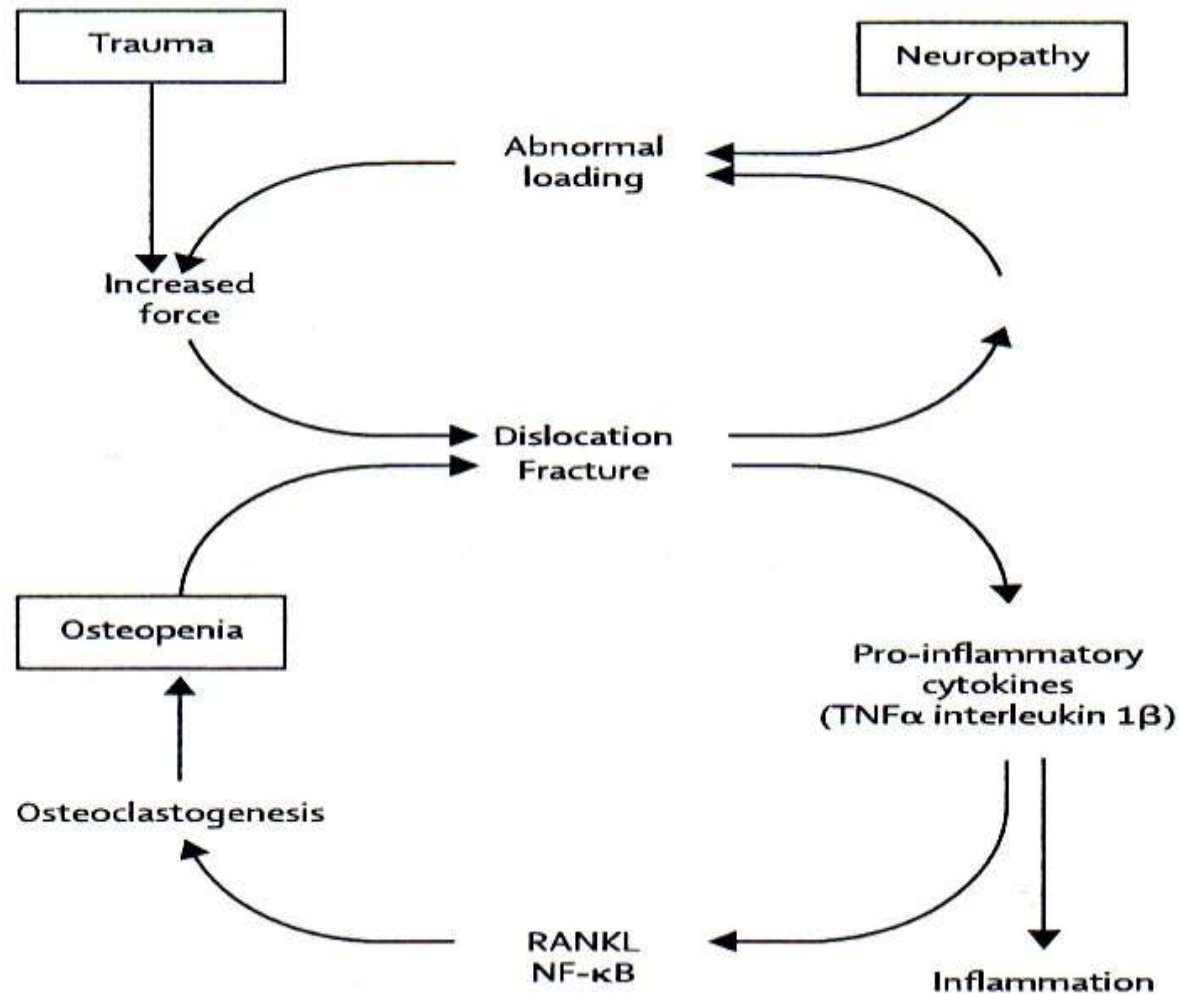
German, Neurotraumatic Theory (Volkmann, 1886)

NEUROTRAUMATIC THEORY (after Volkman, 1886)¹⁵



Charcot Neuroarthropathy

Hypothetic concept about Pathogenesis (Jeffcoate, 2005)





Acute Charcot



- High degree of suspicion
- Warm, inflamed and swollen.
- Temp difference of more than 2 degrees



Charcot Foot

∞ Differential Diagnosis

- Gout
- Deep vein thrombosis
- Cellulitis
- Ankle Sprain
- Septic Arthritis
- Osteomyelitis
- Acute Charcot

Charcot Foot

- Immobilization is the Gold Standard line



Outcome of Diabetic Charcot Foot in Egypt-Prospective Study

- ✎ Aprospective Cohort study was designed from Jan 2010 to End 2013
- ✎ 140 Charcot Foot
- ✎ Presentation is mainly Chronic with deformity and only 18.6% were diagnosed as Acute Charcot
- ✎ Nephropathy was present in 5.7 % and 1 patient with ESRD on hemodialysis
- ✎ Despite the delayed presentation, the outcome was satisfactory in Mansoura Foot Clinic.
- ✎ More effort should be done towards proper diagnosis at acute stage

Gawish et al; DFSG 2013

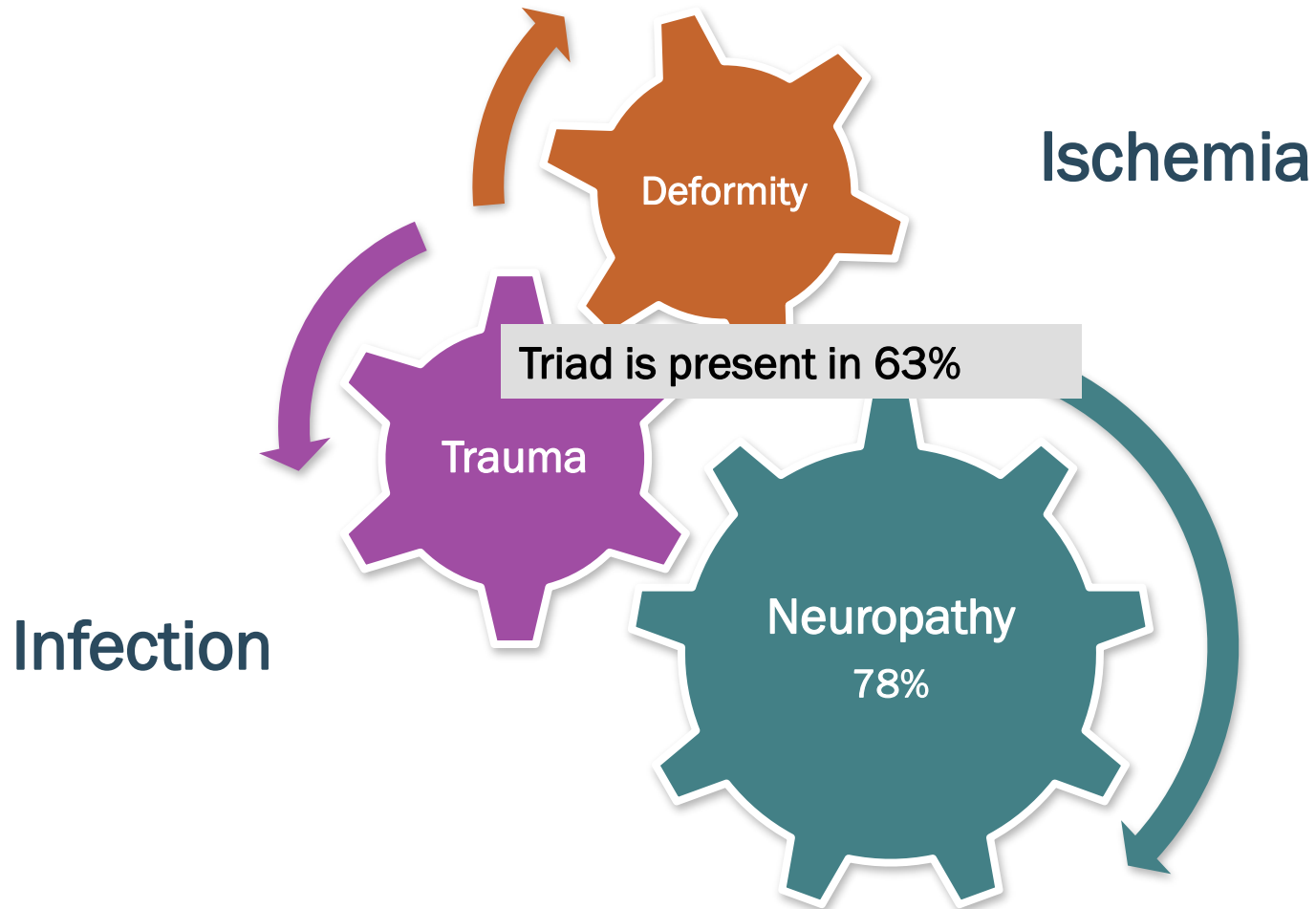
Diabetic Foot Ulcer

∞ The commonest is the heel Ulcer





Causal Pathway for Diabetic Foot Ulcer



Site

∞ Types of DFU

- Neuropathic
- Ischemic
- Neuroischemic

Neuropathic Ulcer

- ☞ Classic Sites:
Under metatarsal heads,
dorsum of the toes and
heel
- ☞ Painless
- ☞ Surrounded by callus
- ☞ Punched out
- ☞ Penetrate to deeper
structure



Ischemic Ulcer

- ∞ Site: edge of foot or toes =poorest blood supply
- ∞ Painful except if associated with PN
- ∞ Surrounding rim of erythema
- ∞ Manifestation of Ischemia



Neuroischemic Ulcer

Different combination of
neuropathy and
ischemia



Wound Bed preparation

T

• **Tissue non-viable**

I

• **Infection**

M

• **Moisture Balance**

E

• **Edges non-advancing**

Diabetic Foot Ulcer

∞ Offloading



Conclusion

- ∞ There is higher incidence of foot disease across all categories of renal disease, including impaired renal function, hemodialysis, continuous ambulatory peritoneal dialysis, renal transplantation and simultaneous pancreas and kidney transplantation.
- ∞ There is higher morbidity of diabetic foot disease including amputation as well as higher mortality in those with concurrent renal disease
- ∞ There is evidence that preventive strategies is the gold standard

Thanks to all Mansoura Foot Team



Thank You

